

AMENDMENTS TO THE CLAIMS

1. (currently amended) A computer-based method for determining an investment portfolio based on investment parameters, the portfolio including a number of assets, the assets having return and factor loading data associated therewith, the method comprising:

selecting a confidence threshold for the investment parameters;

determining a nominal value for the mean return for each asset;

determining a nominal factor loading vector for each asset;

determining a nominal factor covariance matrix;

defining the uncertainty set for the mean return vector based upon the nominal returns for each asset and the confidence threshold;

defining the uncertainty set for the factor loading matrix based upon the nominal factor loading vectors and the confidence threshold;

defining the uncertainty set for the factor covariance matrix based on the nominal factor covariance matrix and the confidence threshold; and

based upon a desired investment objective, applying at least one of said uncertainty sets to an investment problem of interest to determine a market return vector such that the worst case market parameters reside within the applied uncertainty sets with a probability set by the selected confidence threshold, wherein said investment portfolio is based on said market return vector.

2. (original) The computer-based method for determining an investment portfolio of claim 1, wherein the uncertainty set for the mean return vector is defined such that the true mean return vector will reside within said uncertainty set with a probability determined by the confidence threshold.

3. (original) The computer-based method for determining an investment portfolio of claim 1, wherein the uncertainty set for the factor covariance matrix is defined such that the true factor covariance matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

4. (original) The computer-based method for determining an investment portfolio of claim 1, wherein the uncertainty set for the factor loading matrix is defined such that the true factor loading matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

5. (original) The computer-based method for determining an investment portfolio of claim 1, wherein each uncertainty set is defined such that the true value of the parameter associated with the uncertainty set resides within the uncertainty set with a probability determined by the confidence threshold.

6. (original) The computer-based method for determining an investment portfolio of claim 5, wherein the investment problem of interest is selected from the group consisting of a robust minimum variance portfolio selection program, a robust maximum return portfolio selection

program, a robust maximum Sharpe ratio portfolio selection program and a robust value at risk portfolio selection program.

7. (original) The computer-based method for determining an investment portfolio of claim 6, wherein the uncertainty sets take a form such that the selected investment problem of interest is solved by a second-order cone program.

8. (original) The computer-based method for determining an investment portfolio of claim 1, wherein the uncertainty sets take a form such that the investment problem of interest can be solved by a second-order cone program.

9. (original) The computer-based method for determining an investment portfolio of claim 1, wherein the desired investment objective is minimizing risk for an expected return and wherein the investment problem takes the form of a robust minimum variance portfolio selection program.

10. (withdrawn) The computer-based method for determining an investment portfolio of claim 1, wherein the desired investment objective is maximizing expected return for a predetermined level of risk and wherein the investment problem takes the form of a robust maximum return portfolio selection program.

11. (withdrawn) The computer-based method for determining an investment portfolio of claim 1, wherein the desired investment objective is maximizing the worst case ratio of the expected

excess return to the standard deviation of the asset return and wherein the investment problem takes the form of a robust maximum Sharpe ratio portfolio selection program.

12. (withdrawn) The computer-based method for determining an investment portfolio of claim 1, wherein the investment problem takes the form of a robust value at risk portfolio selection program.

13. (currently amended) A computer-based system for determining an investment portfolio based on investment parameters, the portfolio including a number of assets, the assets having return and factor loading data associated therewith, the system comprising:

an input device;

a display device;

computer readable storage, the computer readable storage including program storage and a database of historical return data;

and a processor operatively coupled to the input device, display device and computer readable storage, the processor receiving a program from the computer readable storage and being programmed to operate as follows:

receiving a confidence threshold for the investment parameters received from the input device; reading historical return data for a plurality of assets and factors from the computer readable storage;

determining a nominal value for the mean return for each asset from at least a portion of the historical return data; determining a nominal factor loading vector for each asset from at least a portion of the historical return data; determining a nominal factor covariance matrix;

defining the uncertainty set for the mean return vector based upon the nominal returns for each asset and the confidence threshold;

defining the uncertainty set for the factor loading matrix based upon the nominal factor loading vectors and the confidence threshold;

defining the uncertainty set for the factor covariance matrix based on the nominal factor covariance matrix and the confidence threshold;

and based upon a desired investment objective, applying at least one of said uncertainty sets to an investment problem of interest to determine a market return vector such that the worst case market parameters reside within the applied uncertainty sets with a probability set by the selected confidence threshold, wherein said investment portfolio is based on said market return vector.

14. (original) The computer-based system for determining an investment portfolio of claim 13, wherein the uncertainty set for the mean return vector is defined such that the true mean return vector will reside within said uncertainty set with a probability determined by the confidence threshold.

15. (original) The computer-based system for determining an investment portfolio of claim 13, wherein the uncertainty set for the factor covariance matrix is defined such that the true factor

covariance matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

16. (original) The computer-based system for determining an investment portfolio of claim 13, wherein the uncertainty set for the factor loading matrix is defined such that the true factor loading matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

17. (original) The computer-based system for determining an investment portfolio of claim 13, wherein the uncertainty sets take a form such that the investment problem of interest can be stated in the form of a second-order cone problem.

18. (original) The computer-based system for determining an investment portfolio of claim 13, wherein the desired investment objective is minimizing risk for an expected return and wherein the processor operates a robust minimum variance portfolio selection program module.

19. (withdrawn) The computer-based system for determining an investment portfolio of claim 13, wherein the desired investment objective is maximizing expected return for a predetermined level of risk and wherein the processor operates a robust maximum return portfolio selection program module.

20. (withdrawn) The computer-based system for determining an investment portfolio of claim 13, wherein the desired investment objective is maximizing the worst case ratio of the expected

excess return to the standard deviation of the asset return and wherein the processor operates a robust maximum Sharpe ratio portfolio selection program module.

21. (withdrawn) The computer-based system for determining an investment portfolio of claim 13, wherein the processor operates a robust value at risk portfolio selection program module.

22. (currently amended) Computer readable media ~~programmed with~~ storing programmed instructions defining a computer program for a processor, the computer program determining an investment portfolio based on investment parameters, the portfolio including a number of assets, the assets having return and factor loading data associated therewith, the computer program directing the processor to perform operations comprising:

receiving a confidence threshold for the investment parameters;

determining a nominal value for the mean return for each asset;

determining a nominal factor loading vector for each asset;

determining a nominal factor covariance matrix;

defining the uncertainty set for the mean return vector based upon the nominal returns for each asset and the confidence threshold;

defining the uncertainty set for the factor loading matrix based upon the nominal factor loading vectors and the confidence threshold;

defining the uncertainty set for the factor covariance matrix based on the nominal factor covariance matrix and the confidence threshold;

and based upon a desired investment objective, applying at least one of said uncertainty sets to an investment problem of interest to determine a market return vector such that the worst case market parameters reside within the applied uncertainty sets with a probability set by the selected confidence threshold, wherein said investment portfolio is based on said market return vector.

23. (original) The computer readable media of claim 22, wherein the uncertainty set for the mean return vector is defined such that the true mean return vector will reside within said uncertainty set with a probability determined by the confidence threshold.

24. (original) The computer readable media of claim 22, wherein the uncertainty set for the factor covariance matrix is defined such that the true factor covariance matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

25. (original) The computer readable media of claim 22, wherein the uncertainty set for the factor loading matrix is defined such that the true factor loading matrix will reside within said uncertainty set with a probability determined by the confidence threshold.

26. (original) The computer readable media of claim 22, wherein each uncertainty set is defined such that the true value of the corresponding parameter will reside within said uncertainty set with a probability determined by the confidence threshold.



27. (original) The computer readable media of claim 26, wherein the uncertainty sets take a form such that the investment problem of interest can be stated in the form of a second-order cone problem.

28. (original) The computer readable media of claim 22, wherein the uncertainty sets take a form such that the investment problem of interest can be stated in the form of a second-order cone problem.

29. (original) The computer readable media of claim 22, wherein the desired investment objective is minimizing risk for an expected return and wherein the investment problem takes the form of a robust minimum variance portfolio selection program.

30. (original) The computer readable media of claim 29, wherein the robust minimum variance portfolio selection program is solved using a second order cone program.

31. (withdrawn) The computer readable media of claim 22, wherein the desired investment objective is maximizing expected return for a predetermined level of risk and wherein the investment problem takes the form of a robust maximum return portfolio selection program.

32. (withdrawn) The computer readable media of claim 31, wherein the robust maximum return portfolio selection program is solved using a second order cone program.

33. (withdrawn) The computer readable media of claim 22, wherein the desired investment objective is maximizing the worst case ratio of the expected excess return to the standard deviation of the asset return and wherein the investment problem takes the form of a robust maximum Sharpe ratio portfolio selection program.

34. (withdrawn) The computer readable media of claim 33, wherein the robust maximum Sharpe ratio portfolio selection program is solved using a second order cone program.

35. (withdrawn) The computer readable media of claim 22, wherein the investment problem takes the form of a robust value at risk portfolio selection program.

36. (withdrawn) The computer readable media of claim 35, wherein the robust value at risk portfolio selection program is solved using a second order cone program.

37. (original) The computer readable media of claim 22, wherein the investment problem is one that is user selected from the group including a robust minimum variance portfolio selection program, a robust maximum return portfolio selection program, a robust maximum Sharpe ratio portfolio selection program and a robust value at risk portfolio selection program.

38. (original) The computer readable media of claim 37, wherein the selected investment problem is solved using a second order cone program.